

listed by the California Exotic Pest Plant Council are not included, such as *Arundo donax*, *Carpobrotus edulis*, *Cortaderia jubata*, *Eucalyptus globulus*, *Pennisetum setaceum*, *Tamarix* spp. and *Ulex eropaeus*.

Minor annoyances are the poor print quality, which is particularly noticeable in the photos and figures, and an overabundance of typographical errors.

I am currently using this text in a plant ecology course and, other than the complaint that the price is excessive for a paperback (\$47.00), the students have received *California Vegetation* quite favorably. This group of students has interests ranging from botany to cell biology to wildlife management and find the book informative and the writing style clear and concise. *California Vegetation* has value not only as a textbook but also as the most current desk and field reference on general plant community information. Academics, agency botanists, and consulting biologists should all find something of use in this valuable source.

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Hybrid Zones and the Evolutionary Process. Edited by R. G. HARRISON. 1993. Oxford University Press, New York. 364 pages. Hardcover \$72.00. ISBN 0-19-506917-X.

This book is a collection of papers that were presented as part of a symposium on hybrid zones given at the Fourth International Congress of Systematic and Evolutionary Biology (ICSEB) at College Park, Maryland, in 1990. Additionally, the editor solicited chapters from persons who were not part of the original symposium. The book is divided into two major parts; the first four chapters examine some of the major concepts identified with hybrid zones. The second part consists of eight chapters that are case studies of hybrid zones, but only one of the eight is an example from the plant kingdom. All of the chapters are well illustrated.

From the onset I must say that as a botanist I was disappointed that the book is heavily concentrated on zoological examples, although most evolutionary biologists would agree that natural hybridization in plants is much more common than in animals. In my view this is a serious flaw and it may limit the interest and benefit that the book will have for botanists; because aspects of hybrid zones, including their origin, structure, evolutionary consequences, and fate in plants undoubtedly will be different than for animals. One can not simply extrapolate the aspects of hybrid zones for plants based on animal examples.

In chapter 1, editor Richard Harrison, discusses the hybrid zones from a historical perspective. He explains the basic differences in hybrid zones between animal and plants; plant hybrid zones tend to be diffuse, characterized by local hybrid swarms, whereas animal hybrid zones tend to be well defined. He goes on to define "hybrid" and "hybrid zone" as used by evolutionary biologists of the past and present and explains the controversy that surrounds the definition of these terms. He also introduces the major issues (controversies) in hybrid zone research. Briefly the issues are; the taxonomic treatment of the hybrids and species concepts; origins of hybrid zones, dynamics of stable hybrid zones (Do they represent stable equilibria?); fates of hybrid zones; and causes and consequences of introgressive hybridization.

Chapter two, by N. H. Barton and K. S. Gale, addresses the genetic analysis of

hybrid zones and discusses the methods that can be used to analyze cline width, cline shape, and patterns of linkage disequilibria using a variety of data from morphology, cytology, and electrophoretic (isozymes). The chapter provides an excellent background for those researchers who wish to quantitatively analyze their hybrid zone data. Daniel Howard has authored the third chapter, which discusses the concept of reinforcement, which he defines as "the evolution of prezygotic isolating barriers in zones of overlap or hybridization (or both) as a response to selection against hybridization." He discusses the hypothesis of reinforcement in light of its origin, dynamics and fate. One of the expected outcomes of reinforcement is reproductive character displacement and the author discusses many examples of such. He also presents his recommendations for studying reproductive character displacement. In the end he concludes that although the concept of reinforcement has not often invoked because of numerous strong theoretical objections, it is still widely used by evolutionary biologists to explain the patterns they find in nature.

The fourth of the introductory chapters concerns introgression and its evolutionary consequences in plants and is authored by Loren Rieseberg and Jonathan Wendel. They define and discuss both localized and dispersed introgression in their chapter. A major portion of the chapter is dedicated to a discussion through examples of the evolutionary consequences of introgression including factors such as increase in genetic diversity, transfer of adaptations, origin of new adaptations, origin of new types (and eventually taxa), and reproductive barrier reinforcement to mention a few. Most of their examples rely heavily on electrophoretic (isozymic) and molecular data. They acknowledge that introgression undoubtedly plays a major role in plant evolution, although much remains to be understood. They also present a review of problems that have been encountered when studying introgression. They conclude by indicating future directions in introgression research in plants and point out that molecular markers will continue to provide the best means of studying introgression. We may anticipate that the relatively new techniques molecular will greatly enhance our ability to study introgression with respect to mechanisms and evolutionary consequences. All in all this is an excellent chapter.

The second part of the book that represents case studies of hybrid zones is disproportionately zoocentric. The editor attempts to dismiss the zoocentricity by indicating that few examples of a multidisciplinary approach to the study of introgression exist for plants; apparently the only example worthy of a chapter is one on the Louisiana Irises. Rieseberg and Wendel cite many examples in their chapter and several examples appear to have involved a multidisciplinary approach, these include examples from *Quercus*, *Aesculus*, *Salix*, *Carduus* and especially *Helianthus*.

The chapter on the Louisiana Irises was written by the acknowledged experts on the group, M. L. Arnold and B. D. Bennett. The authors use data from isozymes, rDNA, and RAPD's to strongly support their hypothesis for the origin of hybrid populations. Their chapter, like Rieseberg and Wendel's (chapter 4), also emphasizes the unquestionable utility of genetic data in studying plant taxa and their hybrids. They also point out that most plants offer the opportunity to study the fate of individuals in hybrid zones over time, which is information not so easily attained in most animal studies. This chapter is very well-written and is an excellent summary of the past 60 years research on the Irises of Louisiana.

The remaining seven chapters deal with various animal examples including grasshoppers (2 chapters), flickers, *Heliconius* butterflies, toads, pocket gophers, and eutherian mammals. I found the chapters on *Caledia* grasshoppers from Australia and *Bombina* toads from Europe to provide the most convincing evidence of hybrid zones because the multifaceted approaches that have been applied to the problem using a diversity of data from morphology, cytology, isozymes, nrDNA, and mtDNA. The chapter on *Heliconius* butterflies, while only using morphological data, is particularly fascinating because of the complex morphological patterns that exist in different races of these butterflies.

In summary, I find that the major drawback to this book for botanists is its con-

centration on zoological examples. I don't agree with the editor's contention that only one good plant example (Irises) could be found. The chapters by Arnold and Bennett on Irises and by Rieseberg and Wendel on introgression, as well as the other three chapters from Part I of the book, are very worthwhile reading, but I'm not sure whether this warrants the purchase of the book. For researchers interested in the general phenomenon of hybrid zones across both the plant and animal kingdoms, this book might be a very worthwhile purchase.

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The Wild Orchids of California. By RONALD A. COLEMAN. Comstock Publishing Associates, Cornell University Press, 572 E. State St., Ithaca, NY 14850, USA, 1995, xvi, [i], 201 pp., 39 [i.e., 40] pp. pls. (col.), text ill. (B&W), ISBN 0-8014-3012-7 (HB), \$45.00.

Until now there never has been a book on the native orchids of California. Ronald A. Coleman's superb *The Wild Orchids of California* now rectifies this deficiency. He treats 11 genera, 33 species (all native but the alien *Epipactis helleborine*), and 3 hybrids (*Platanthera* × *estesii*, *P.* × *lassenii*, *P.* × *media*). The hybrids, a "Spiranthes undescribed" (p. 166), and the appropriately newly described *Piperia colemanii* Morgan & Glicenstein (*Lindleyana* 8:89, 1993) are not in *The Jepson Manual* (JM; 1993). Other differences from the JM's orchid part done by Dieter H. Wilken and William F. Jennings are Coleman's recognition of *Platanthera dilatata* var. *leucostachys* (in JM as *P. leucostachys*) and varieties for *Calypso bulbosa* (var. *occidentalis*) and *Corallorhiza trifida* (var. *verna*) (consistently, *Malaxis monophyllos* ssp. *brachypoda* in JM appears in Coleman as var. *brachypoda*).

Excellent color pictures (124 total) illustrate all 36 taxa Coleman accepts; all but the hybrids and undescribed *Spiranthes* have county distribution maps with a single dot for each county record. The floral vignettes prefacing the species accounts are more decorative than diagnostic. The only real orchid flower diagrammed is the generalized figure on page 5. The lack of meaningful drawings is a minor defect forcing overreliance on the color photos. The elaborate accounts are the heart of the book, indeed 135 pages for the 32 taxa treated (3 pages are on the hybrids and undescribed *Spiranthes*). Other than their etymology, extensive synonymy, and common names, the species accounts are in literary rather than telegraphic format, with detailed information for the morphological description, distribution, habitat, phenology, conservation, and (often) notes and comments. Bolding these subject headers would have made the information more accessible.

The introductory 27 pages discuss orchid structure, phenology and distribution of Californian orchids (with three tables, a two-page phenology table, and two maps), biogeography and climate of California, chief geographic areas of the state (with one map), and habitat protection. The introduction concludes with an unillustrated key to genera that is simpler and probably more useful than its counterpart in JM. Genera with more than one species also have keys. One appendix gives herbarium documentation for the Channel Islands and the 58 counties in California. Another appendix lists potential new county records as well as *Cypripedium parviflorum* var. *makasin* and *Spiranthes infernalis* as potential new species for California. A concise glossary, ten-page bibliography, and detailed index finish this fine work.

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